Performance Monitoring and Reporting: WSDOT's Experience

53rd Virginia Transportation Conference

October 19, 2004
Roanoke, Virginia

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Washington State Department of Transportation

What motivated the *Gray Notebook* effort?

WSDOT In Crisis:

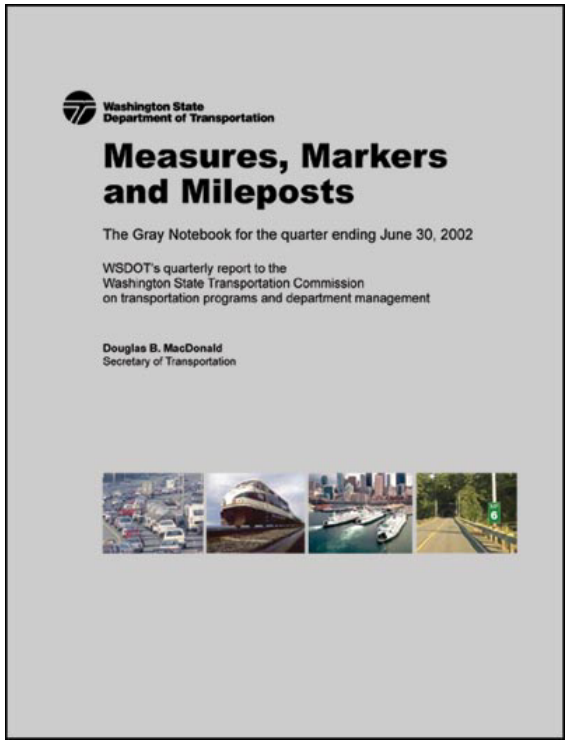
- Revenue erosion from voter cutback on transportation taxes.
- Blue Ribbon Commission and gubernatorial concerns over departmental inefficiency and lack of accountability
- Media/talk show preoccupation with state's "transportation crisis"
- Legislature embroiled in partisan and regional contentions
- WSDOT employee morale in the tank

April 2001: Arrival of WSDOT CEO, Douglas B. MacDonald

WSDOT's Short-term, strategic approach:

Two Simple Themes:

- Accountability
- Project Delivery



Create a new tool, a quarterly performance report:

"Measures, Markers and Mileposts"* or *The Gray Notebook

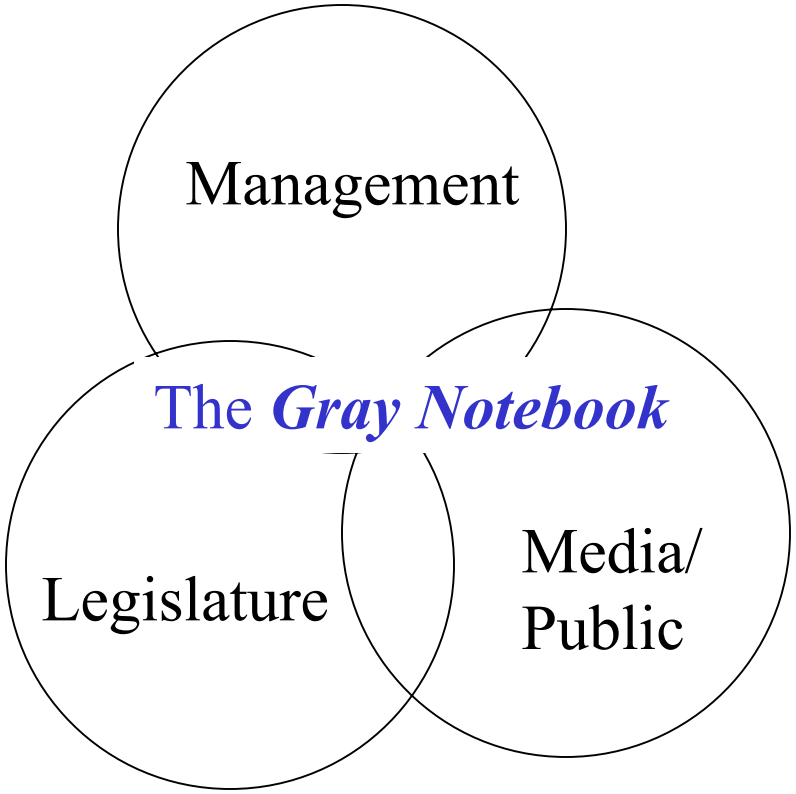
The Accountability Rx:

Demonstrated

Performance

Effectively Communicated

In Real-time



Results To Date Include:

Positive contributions towards improved public and legislative perception and credibility

- **"It's your nickel, watch it work"** New Transportation Revenue Package. Five cents/gallon gas tax increase took effect July 1, 2003

  New quarterly project/program reports to show what's happening with the money and how well it's being spent: The *Beige Pages* insert in the *GNB* focuses specifically on construction program delivery in narrative form

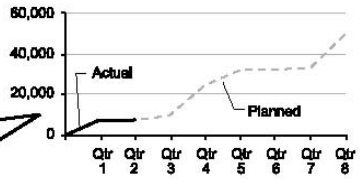
Anatomy of Performance Journalism©

Highway Maintenance Program: Quarterly Update

Selected Maintenance Activity Measures

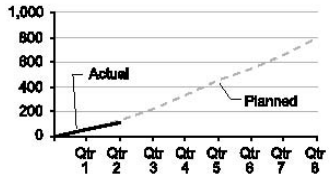
The line charts show planned production (dotted line) and actual production (solid line) related to select maintenance activities for the 2001-2003 biennium to date.

Pavement Striping
Miles of Roadstripe Painted
Actual vs. Planned



Pavement striping repaints the yellow and white lines on the highway. Striping must be repainted each year as traffic wears it out. Note: Over 255 miles of painted striping will not require annual re-painting because they were painted with durable markings in 2001.

Repairs of Sign Bridges
Number of Sign Bridges Repaired
Actual vs. Planned

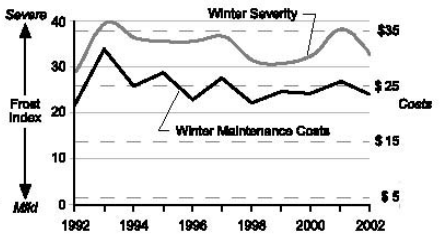


Sign bridges are structures used to mount large signs over or near highways. These structures periodically need repairs of loose or rusted bolts, bracing, and foundations.

Snow and Ice Control Operations

During winter months, the primary focus of the Maintenance program is to provide safe and reliable driving conditions by plowing and/or sanding the roadway when snow and/or ice has accumulated. The severity of winter weather is a major factor in snow and ice control costs incurred by WSDOT. The Frost Index is a numerical value that scientifically identifies the overall severity of statewide winter weather. The chart on the right shows, unsurprisingly, that the colder the winter, the higher the winter maintenance costs.

Fiscal Year Winter Severity and Maintenance Costs
Costs in millions (2002 dollars)



Let it snow, let it snow, let it snow! And we'll plow. Snapshot of a winter maintenance day: U.S. 2 at Stevens Pass received 26 inches of snow one early morning this winter. WSDOT advised travelers about the closure by contacting television media, radio stations, and the Washington State Patrol. WSDOT also broadcast advisories using Internet web sites, highway advisory radio, and variable message signs. Once the pass was closed around 4 am, maintenance crews began avalanche control. Using dynamite, snow was blasted off the hillsides, blocking all four lanes of the highway in 10-40 feet of snow. Meanwhile it continued to snow, and the rest of Stevens Pass required clearing as well. Help was needed. Maintenance crews were called in early while Wenatchee crews shifted to Leavenworth, and Leavenworth crews shifted to Stevens Pass. All lanes were open to traffic by 7 am. Crews continued to keep the traffic flowing as an additional 12 inches of snow fell. In a three-day period, Stevens Pass received a total of 63 inches of new snow while traffic kept moving.

Clutter-free charts

Plain English text

Introduce concept and explain chart

Display complex information in easily understood terms

Picture illustrates story and data

Storytelling

Limitations of PowerPoint

GOVERNMENT EXECUTIVE

September 1, 2004

Is PowerPoint the enemy of thought?

By Shane Harris

"It's no accident that PowerPoint
thin on content. The president wa
concept that force could be appli
carefully across the different slic
interview two years later, Bush s
'the little starbursts' on the matrix
the detail."

sharris@govexec.com

The New York Times

Today's Headlines

PowerPoint Makes You Dumb

By CLIVE THOMPSON Published: December 14, 2003

http://query.nytimes.com/gst/abstract.html?res=F30A1FFE3D580C778DDDAB0994DB404482&incamp=archive:search

In August, the Columbia Accident Investigation Board at NASA released Volume 1 of its report on why the space shuttle crashed. As expected, the ship's foam insulation was the main cause of the disaster.
oint,

The Cognitive Style of PowerPoint

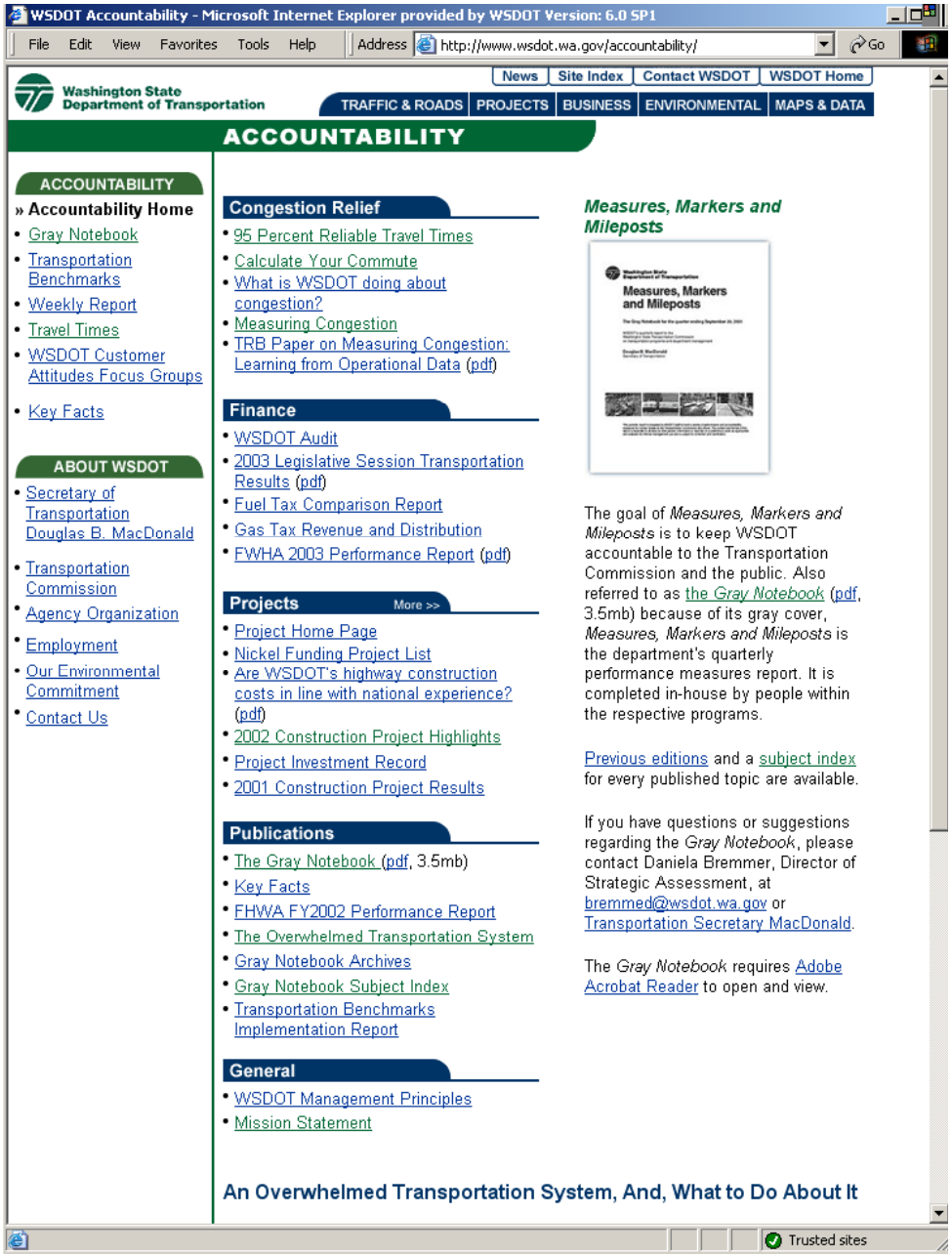
Edward R. Tufte

Bullet Outlines Dilute Thought

"For the naïve, bullet lists may create the appearance of hard-headed organized thought. But in the reality of day-to-day practice… a study in the Harvard Business Review found generic, superficial, simplistic thinking in the bullet lists widely used in business planning and corporate strategy. What the authors are saying here, in the Harvard Business Review's earnestly diplomatic language, is that bullet outline can make us stupid."

www.edwardtufte.com

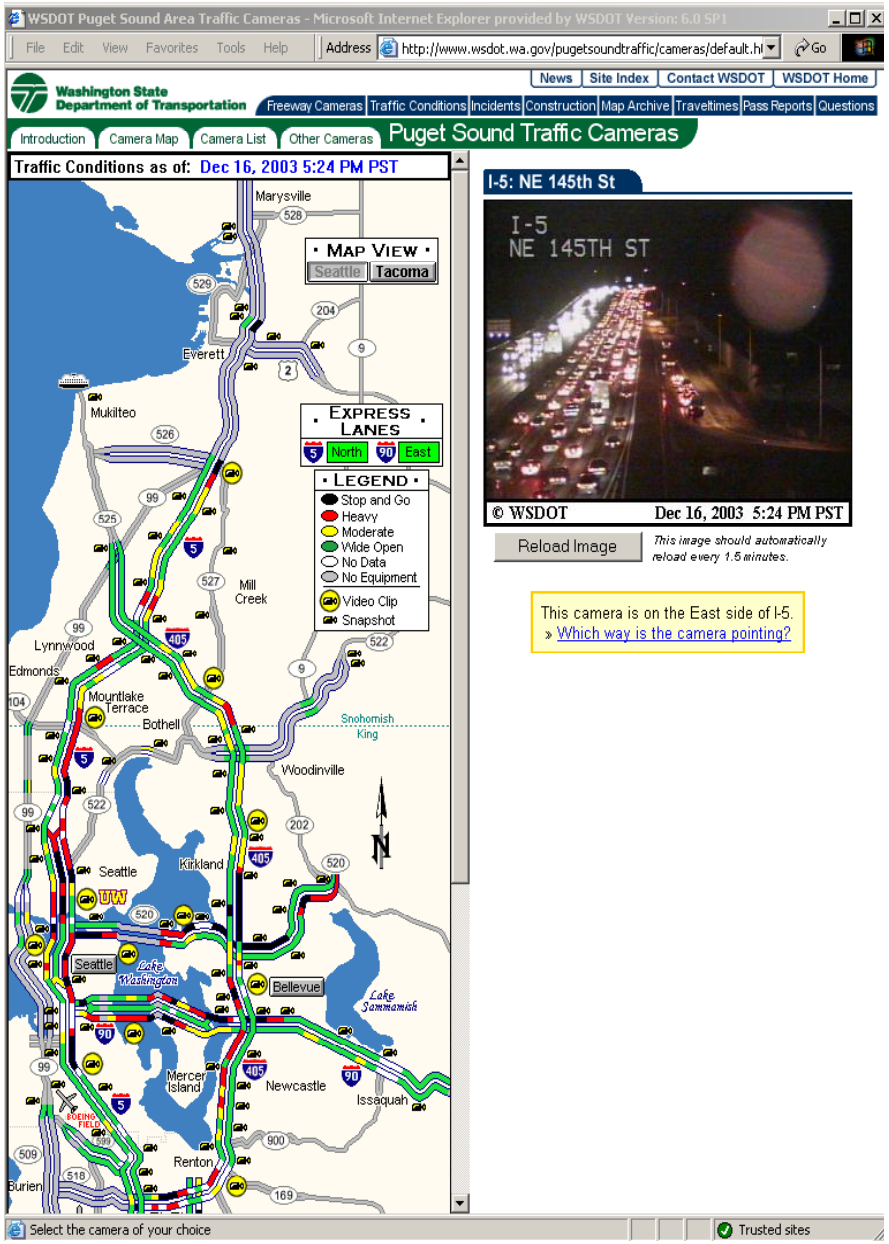
Accountability information (including the *Gray Notebook)* is prominent on the WSDOT Website, and distributed across the state



The *GNB* Challenge:

Measuring Congestion and Communicating Highway Condition and Performance Information

What is the Story?



Measuring WSDOT's Incident Response Program

- Joint Operations agreement with State Patrol (2002)
- Zero over-90 minute incident performance target
- Doubled IRT units (July 2002)
- Incident Response Database (WITS)

Response Types
April to June 2004
Total Incident Responses = 13,392

	April	May	June
Fatality Collisions	6	16	8
Injury Collisions	119	120	112
Non-injury Collisions	324	364	291
Disabled Vehicles	2,720	2,532	2,552
Abandoned Vehicles	802	712	763
Debris	452	422	518
Fire	21	19	27
Hazardous Materials	7	18	11
Other	174	199	193

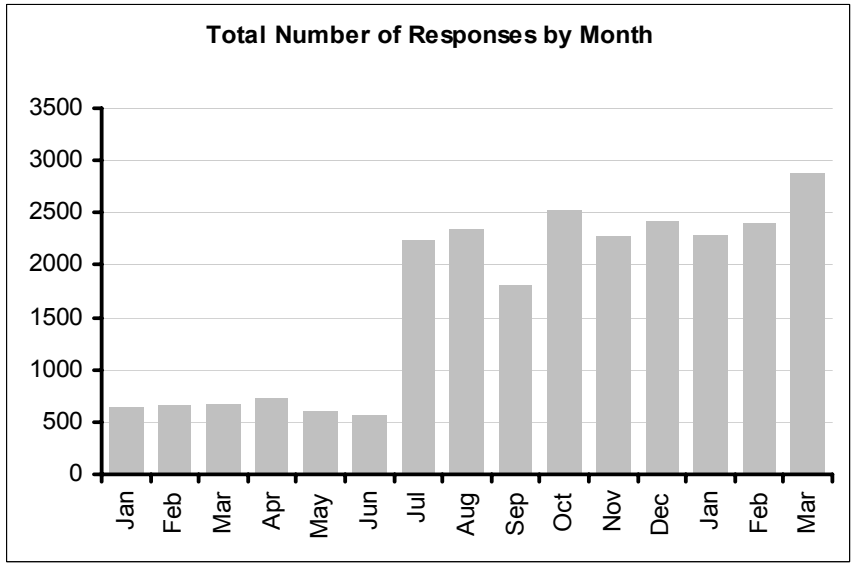
*Some non-collisions fall into more than one of the above categories.

Service Actions for Non-Collision Responses
Service Actions Taken for Non-Collision Responses**
April to June 2004 Top Seven

	April	May	June
Traffic Control	602	586	545
Provided Fuel	386	329	305
Changed Flat Tire	323	318	308
Minor Repair	199	158	169
Pushed Vehicle	193	161	143
Towed Vehicle	77	87	86
Cleared Debris	394	342	416

*Most common service actions only-exclude various miscellaneous actions taken.

Performance Justifies Funding



November 13, 2002
"This is a good use of my tax dollars. Car couldn't be fixed at the time but he really tried and he got me off the road safely. Very pleasant and helpful, keep him. He is very good!"

December 13, 2002
"The WSDOT person was outstanding and ensured my safety. Gladly pay taxes to ensure this service!"

December 26, 2002
"Please keep this service, we need it bad. Thank you so much!"

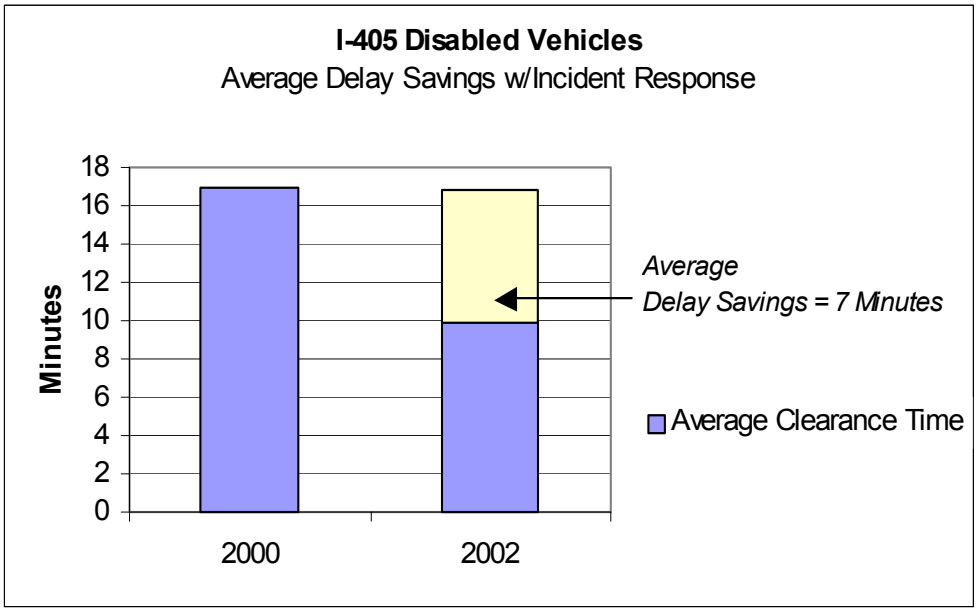
One Disabled Vehicle Incident -

I-405 Case Study

Total motorist savings in fuel and other operating costs: $5,800 per incident

Savings in time: more than $7,000 per incident

On average, over 2,000 disabled vehicles per month



WSDOT's Approach: Congestion Measurement Principles

Use real time measurements (rather than computer models) whenever possible.

Measure congestion due to incidents as distinct from congestion due to inadequate capacity.

Show whether reducing congestion from incidents will improve the travel time reliability.

Demonstrate both long-term trends and short-to-intermediate term results.

Communicate about possible congestion fixes using an "apples-to-apples" comparison with the current situation (for example, if the trip takes 20 minutes today, how many minutes shorter will it be if we improve the interchange?

Use plain English to describe measurements.

CONGESTION IN THE NEWS

Seattle's traffic is 2nd-worst: City trails only L.A. in study

By Peyton Whitely , Seattle Times: **Tuesday, May 08, 2001**

We're in a jam - and we may be stuck there for a while

Seattle Times**: Sunday, August 12, 2001**

Seattle drops to fifth in traffic congestion

By Eric Pryne , Seattle Times: **Friday, June 21, 2002**

Seattle traffic is bad, but ranking may be bad, too

By Eric Pryne, Seattle Times: **Monday, June 03, 2002**

Traffic congestion rating has officials in Portland fuming

– *worse than Seattle;* **By Lisa Grace Lednicer, Oregonian: October 6, 2003**

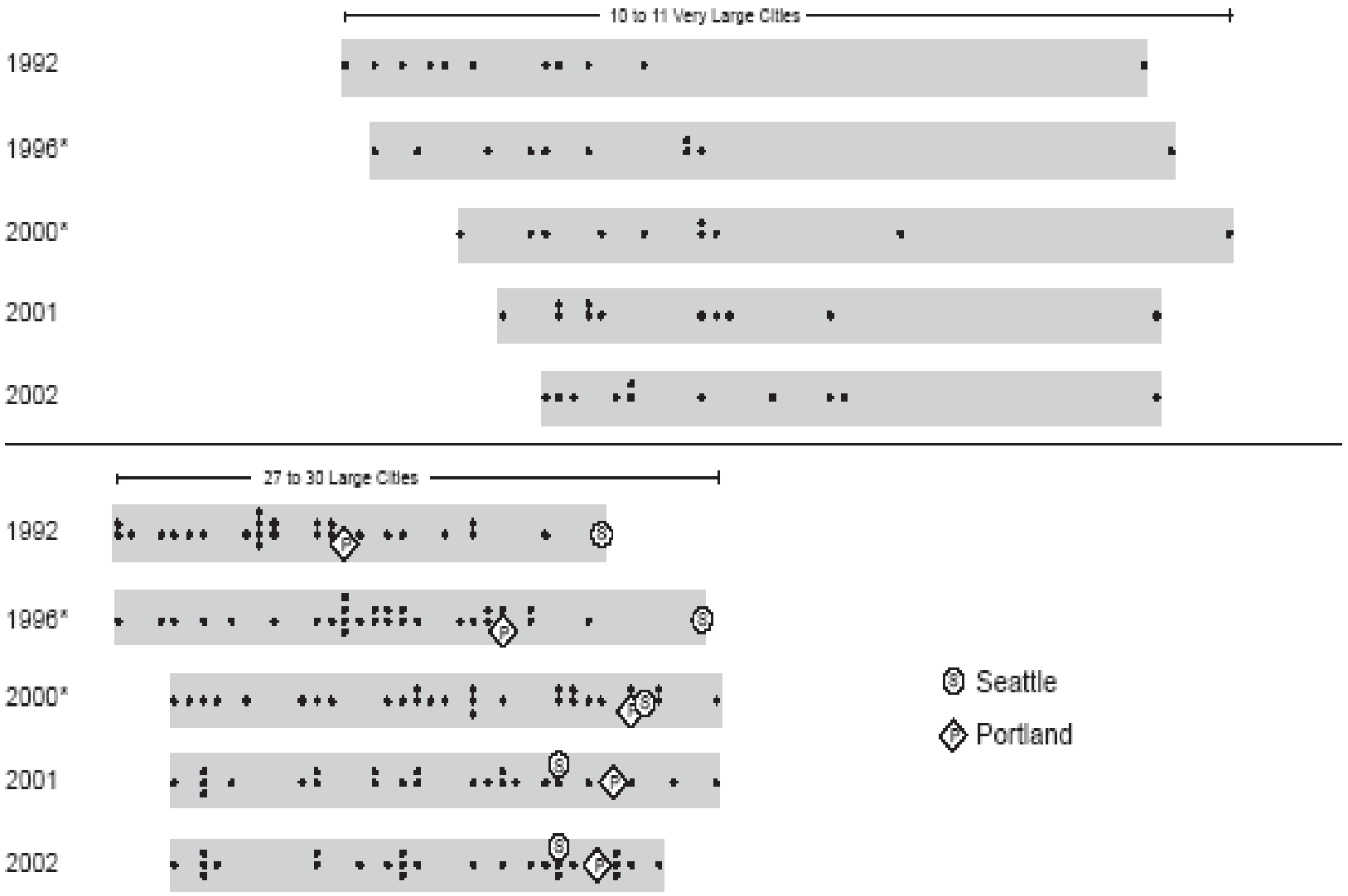
Seattle traffic congestion down from a decade ago - *by 27 percent*

By Eric Pryne, Seattle Times: **Tuesday, September 7, 2004**

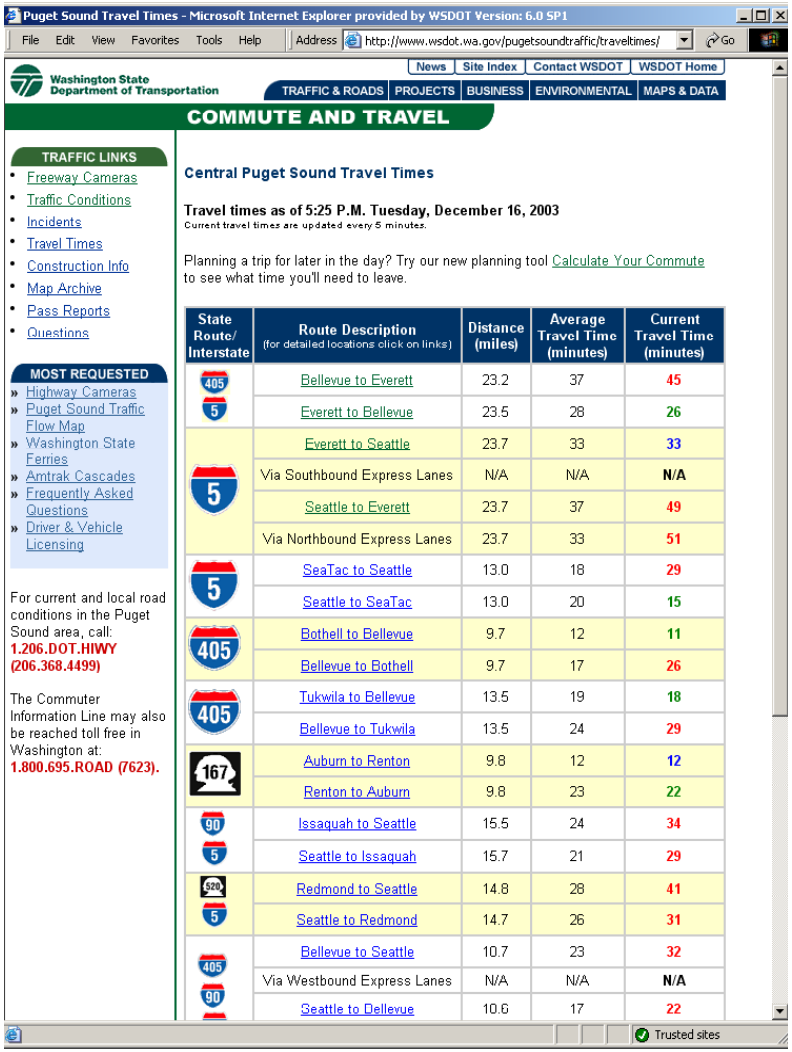
Traffic Congestion Ranges: TTI Travel Time Index

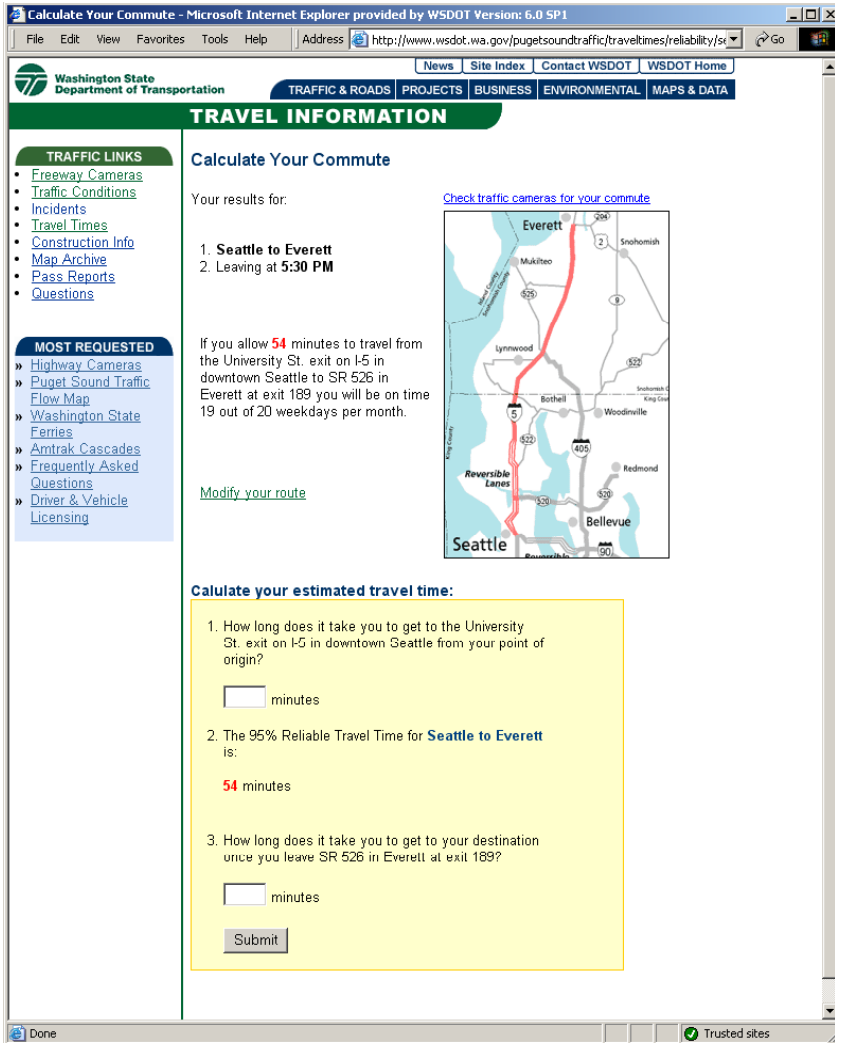
1992, 1996*, 2000*, 2001, 2002 for 85 Cities in four size ranges

Each dot represents the TTI "score" for one of the cities in its group



What we have done so far: Measuring Real-time travel times and Reliability





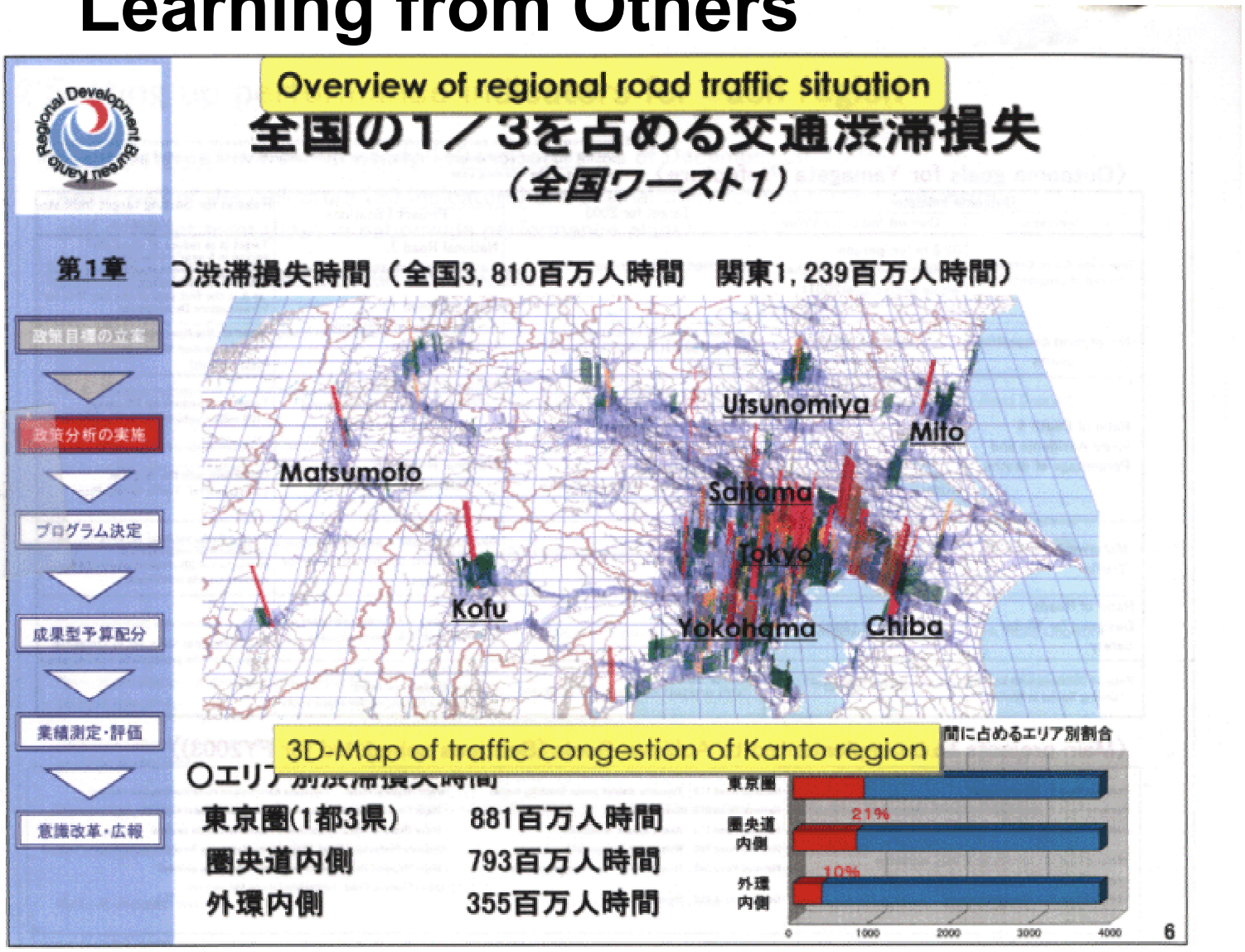
Key Commute Routes - Changes in Travel Time Performance: 2002 to 2003

Key Commute Routes - Changes in Travel Time Performance: 2002 to 2003

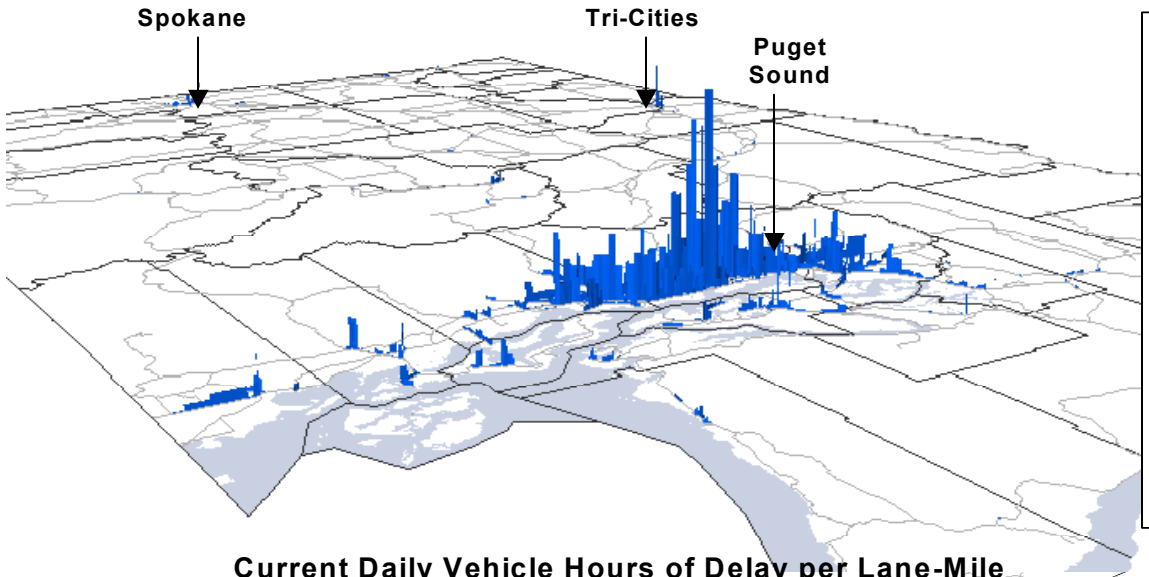
Routes in the table are ranked by this column from largest percent of improvement to largest percent of deterioration

Commutes				Peak Travel Time				95% Reliable Travel Time				Number of Days When Travel Times Exceeded Twice the Time Associated with Freeflow		
Route	Route Description	Peak Time	Length in Miles	2002	2003	Change	Percent Change	2002	2003	Change	Percent Change	2002	2003	Percent Change
SR 167	Renton to Auburn	5:20 PM	9.8	19 min.	16 min.	-3 min. (-16%)	-16%	37 min.	27 min.	-10 min.	-27%	92 days	53 days	-42%
I-5	Seattle to SeaTac	3:40 PM	13.0	19 min.	18 min.	-1 min. (-5%)	-5%	28 min.	22 min.	-6 min.	-21%	30 days	4 days	-87%
I-90/I-405	Issaquah to Bellevue	7:50 AM	9.5	16 min.	16 min.	No change	0%	24 min.	22 min.	-2 min.	-8%	50 days	41 days	-18%
I-405/I-90	Bellevue to Issaquah	5:30 PM	9.3	15 min.	15 min.	No change	0%	19 min.	19 min.	No change	0%	22 days	8 days	-64%
I-5	Seattle to Everett	4:20 PM	23.7	42 min.	42 min.	No change	0%	60 min.	60 min.	No change	0%	65 days	63 days	-3%
I-405	Bellevue to Tukwila	5:25 PM	13.5	25 min.	25 min.	No change	0%	34 min.	31 min.	3 min.	-9%	78 days	81 days	4%
I-5	SeaTac to Seattle	7:40 AM	13.0	23 min.	23 min.	No change	0%	18 min.	17 min.	-1 min.	-6%	--	--	--
I-90/I-5	Issaquah to Seattle	7:45 AM	15.5	23 min.	23 min.	No change	0%	31 min.	32 min.	1 min.	3%	13 days	18 days	28%
I-5/I-90	Seattle to Issaquah	5:35 PM	15.7	22 min.	22 min.	No change	0%	32 min.	32 min.	No change	0%	21 days	17 days	-20%
I-405/I-90/I-5	Bellevue to Seattle	8:30 AM	10.7	15 min.	15 min.	No change	0%	20 min.	23 min.	3 min.	15%	7 days	15 days	53%
I-5/I-90/I-405	Seattle to Bellevue	5:35 PM	10.6	17 min.	17 min.	No change	0%	27 min.	27 min.	No change	0%	49 days	53 days	8%
SR 520/I-405	Redmond to Bellevue	7:50 AM	7.2	9 min.	9 min.	No change	0%	11 min.	11 min.	No change	0%	1 day	3 days	66%
I-405/SR 520	Bellevue to Redmond	5:35 PM	6.8	12 min.	12 min.	No change	0%	16 min.	17 min.	1 min.	6%	48 days	62 days	23%
I-405	Tukwila to Bellevue	7:40 AM	13.5	30 min.	31 min.	1 min.	3%	41 min.	42 min.	1 min.	2%	178 days	199 days	11%
SR 520/I-5	Redmond to Seattle	7:45 AM	14.8	21 min.	22 min.	1 min.	5%	28 min.	29 min.	1 min.	4%	7 days	11 days	36%
I-5/SR 520/I-405	Seattle to Bellevue	5:35 PM	10.1	18 min.	19 min.	1 min.	6%	28 min.	25 min.	3 min.	-11%	68 days	48 days	-29%
SR 167	Auburn to Renton	7:30 AM	9.8	15 min.	16 min.	1 min.	7%	21 min.	24 min.	3 min.	14%	18 days	27 days	33%
I-5/SR 520	Seattle to Redmond	5:30 PM	14.7	25 min.	27 min.	2 min.	8%	34 min.	37 min.	3 min.	9%	63 days	68 days	7%
I-5	Everett to Seattle	7:15 AM	23.7	43 min.	47 min.	4 min.	9%	63 min.	70 min.	7 min.	11%	86 days	106 days	19%
I-405/SR 520/I-5	Bellevue to Seattle	7:50 AM	10.5	17 min.	19 min.	2 min.	12%	23 min.	26 min.	3 min.	13%	26 days	68 days	62%

What is Next:
Learning from Others



With Demand Growing and Supply Stagnant, Congestion as Measured by Traveler Delay has Increased



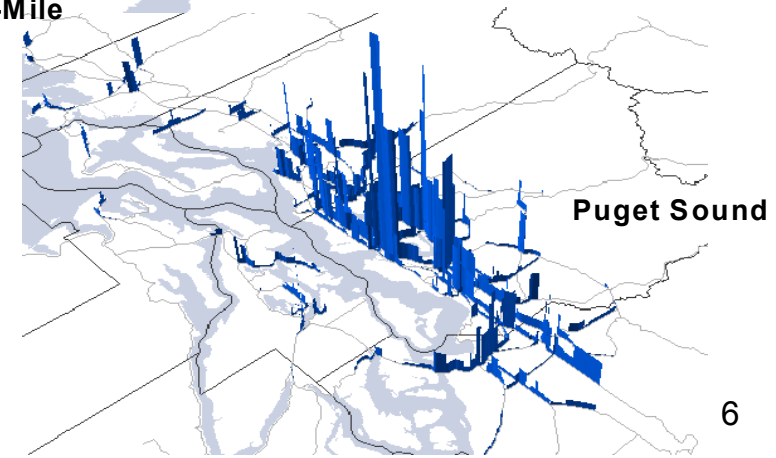
Current Daily Vehicle Hours of Delay per Lane-Mile

Measuring Congestion

24 hour vehicle delay, in WSDOT's view, is the most basic and accessible measure for describing congestion. It indicates which roadways are congested, and gives an indication of the severity of congestion and how long it lasts.

Congestion is primarily concentrated in the urban areas, especially Puget Sound, Vancouver and Spokane.

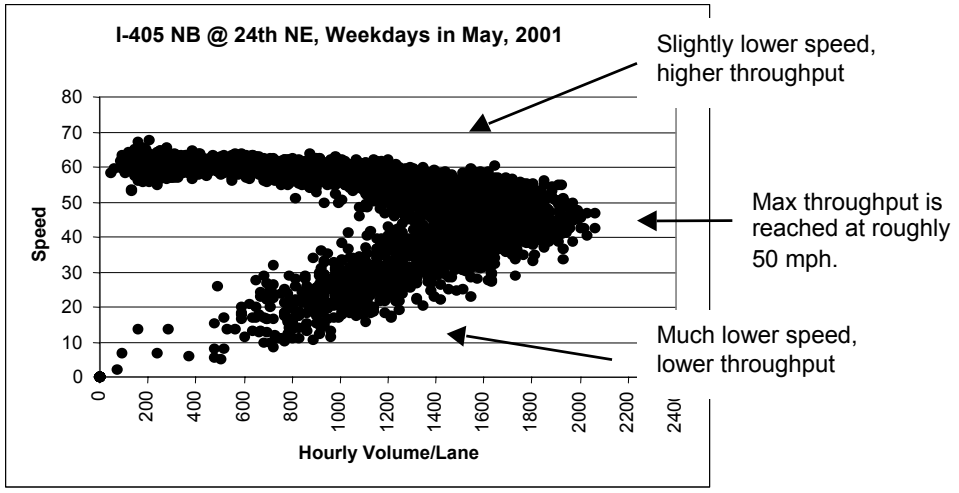
The highest spike depicted on the map is located at the interchange for I-5 and I-90 in Seattle, where the average tally is about 825 vehicle hours of delay per lane mile per day.



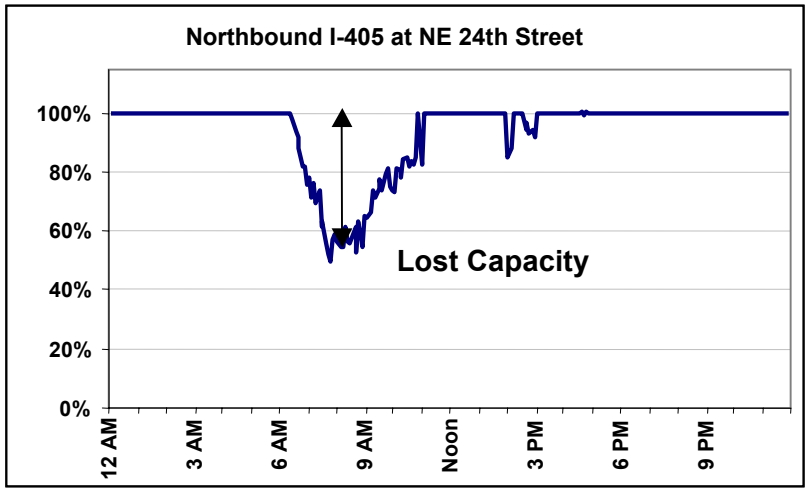
6

The Relationship Between Delay and Efficiency

- Maximum freeway throughput is typically at speeds of 45 -50 mph. This accommodates about 2000 vehicles per hour per lane. System throughput drops dramatically when traffic volume forces speeds to drop below 50 mph.



Volume and Speed Relationship

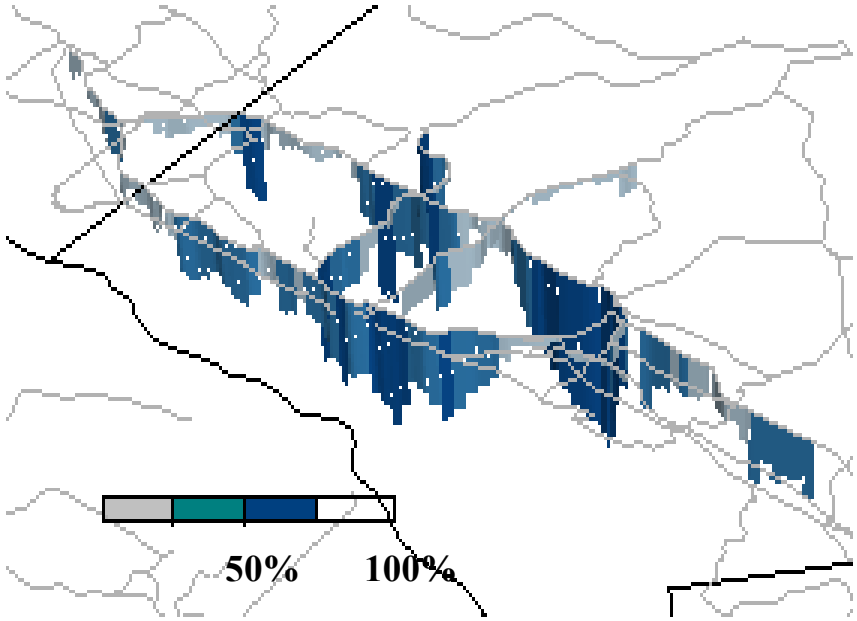


Percent of Productivity Lost Due to Delay

- During the peak period on I-405, congestion reduces the throughput of the 2 general purpose lanes in Renton to the capacity of one free -flowing lane.

The Lost Productivity on Puget Sound Freeways is Staggering

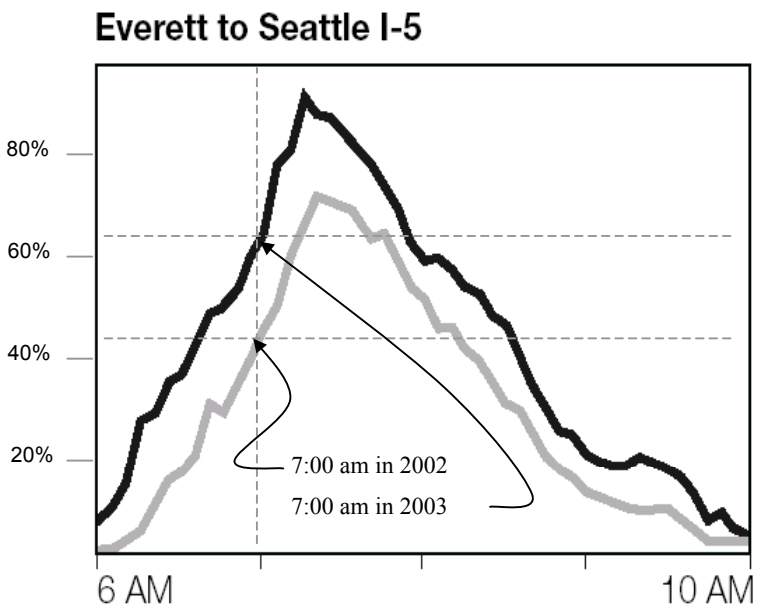
In the peak travel period on an average weekday, delay causes significant loss in productivity throughout Puget Sound freeways by as much as 60% when they are needed the most!



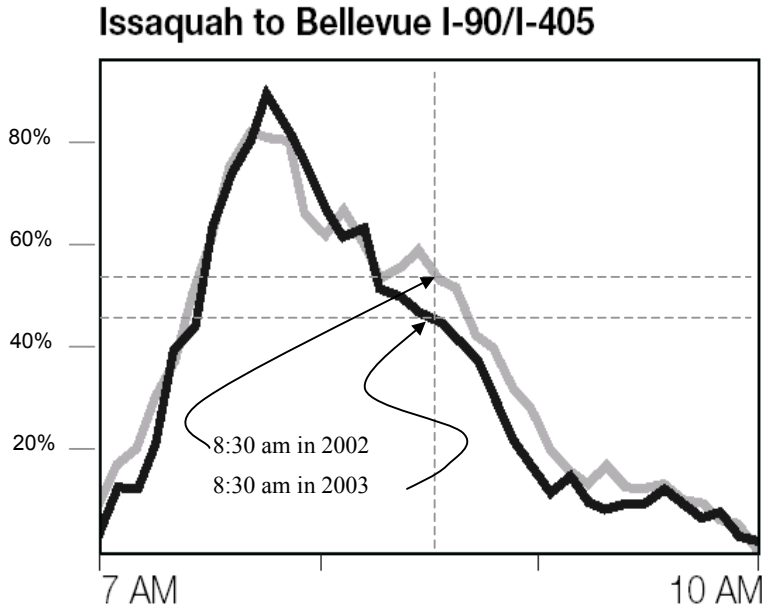
Percent of Productivity Lost Due to Delay

Top Commutes - Speeds less than 35 mph

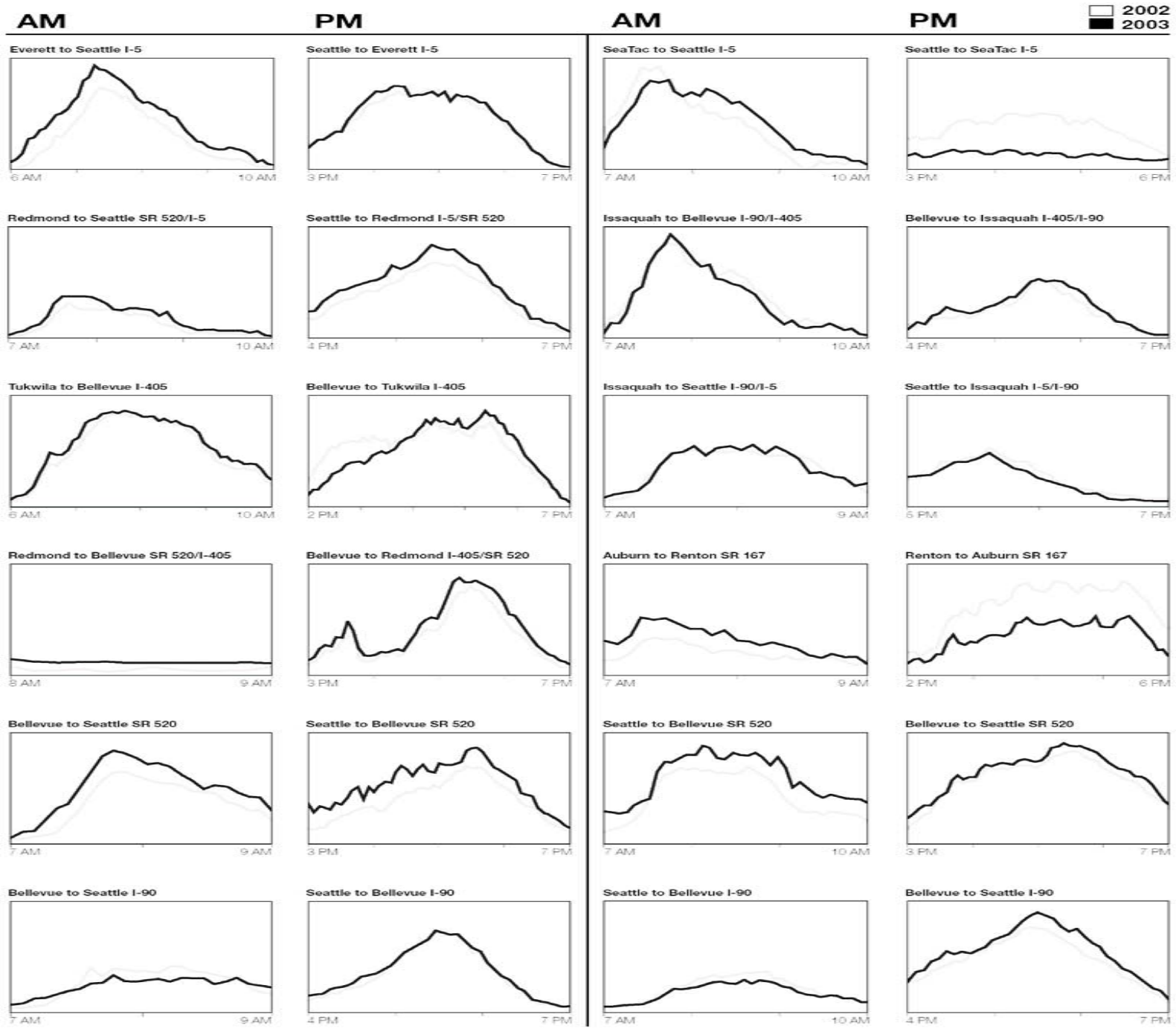
Highway loop detectors feed information into computers every five minutes 24 hours a day that detect the speed, and the amount of traffic.



At 7:00am in 2002, you had about a 45% chance that traffic would be moving at less than 35 mph. In 2003, the situation was a little worse (black line above the gray line); your chance that traffic would be moving slower than 35 mph was about 65%.



At 8:30am in 2002, you had about a 55% chance that traffic would be moving at less than 35 mph. In 2003, the situation was a little better (black line below the gray line); your chance that traffic would be moving slower than 35 mph was about 45%.


AM
PM
AM
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2002
2003
Everett to Seattle I-5
6 AM
10 AM
Seattle to Everett I-5
3 PM
7 PM
SeaTac to Seattle I-5
7 AM
10 AM
Seattle to SeaTac I-5
3 PM
6 PM
Redmond to Seattle SR 520/I-5
7 AM
10 AM
Seattle to Redmond I-5/SR 520
4 PM
7 PM
Issaquah to Bellevue I-90/I-405
7 AM
10 AM
Bellevue to Issaquah I-405/I-90
4 PM
7 PM
Tukwila to Bellevue I-405
6 AM
10 AM
Bellevue to Tukwila I-405
2 PM
7 PM
Issaquah to Seattle I-90/I-5
7 AM
9 AM
Seattle to Issaquah I-5/I-90
5 PM
7 PM
Redmond to Bellevue SR 520/I-405
8 AM
9 AM
Bellevue to Redmond I-405/SR 520
3 PM
7 PM
Auburn to Renton SR 167
7 AM
9 AM
Renton to Auburn SR 167
2 PM
6 PM
Bellevue to Seattle SR 520
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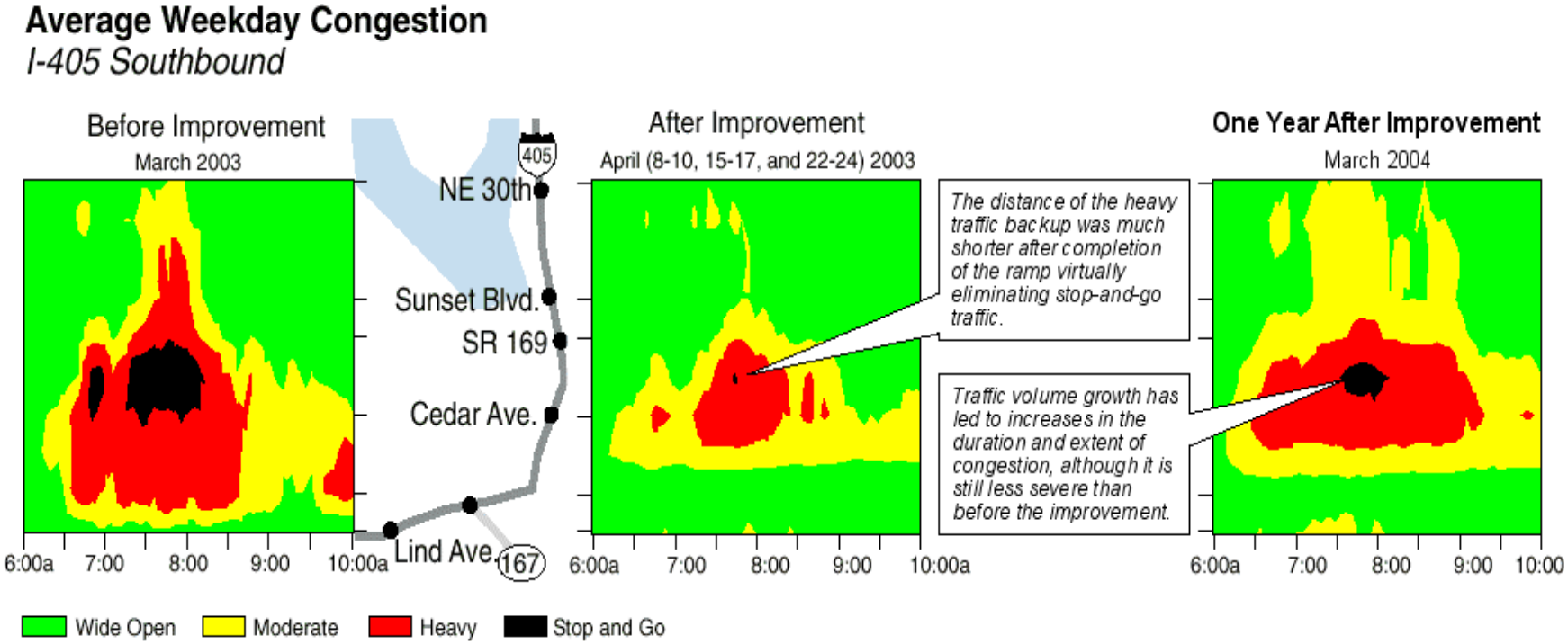
Bellevue to Seattle SR 520
3 PM
7 PM
Bellevue to Seattle I-90
7 AM
9 AM
Seattle to Bellevue I-90
4 PM
7 PM
Seattle to Bellevue I-90
7 AM
10 AM
Bellevue to Seattle I-90
4 PM
7 PM

Case Studies – Before and After Results

I-405 / SR 167 Ramp Separation (flyover Ramp) project in Renton



Additional Case Studies (to be presented in upcoming GNB):

SR 167 Ramp Separation Project
I-5 HOV Extension

“Anticipating and Embracing Innovation”

Find Out What Works - Act Now!

Smart Roads – Smart Vehicles

- Vehicle Infrastructure Integration Program (VII)
- Adaptive Cruise Control
- Collision Avoidance and Roadway Departure Alarm Systems
- Variable Speed Limits
- Narrower Lane Widths
- Automated Maintenance
- Web and 511 customized traveler information
- Arterial Signalization / Ramp Metering Interactivity
- Transit Applications
- **BETTER SYSTEM MEASUREMENTS/DATA –**
- **WORKING TOGETHER to TELL THE STORY!**

This presentation available via :

- **ftp://ftp.wsdot.wa.gov/public/GrayNotebook/**

Other links:

GNB: Quarterly Performance Report:
http://www.wsdot.wa.gov/GrayBook/

Current Travel Times/Reliability:
http://www.wsdot.wa.gov/pugetsoundtraffic/traveltimes/

Measuring Congestion: Learning from Operational Data (TRB paper-pdf)
http://www.wsdot.wa.gov/accountability/

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Next GNB due out November 22nd **http://www.wsdot.wa.gov/accountability/GrayNotebook.pdf**